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1993 Annual Report Of Activities

Jamie L. Whitten Plant Materials Center
Coffeeville, Mississippi

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STAFF

Full time employees	Position
David M. Lane	Manager
Joseph A. Snider	Assistant Manager
B.B. Billingsley Jr.	Project Leader
Luther H. Bloodworth Jr.	Agronomist
Janet M. Grabowski	Biologist
Laura T. Mason	Secretary
William D. Benoist	Biological Technician
Jeff H. Tillman	Biological Technician
Jimmie Miller	Mechanic

Part time employees	Position
Carolyn M. Pierce	Office Clerk
James R. Shaw	Gardener
Thomas J. Reed	Gardener
Roger L. Turner	Gardener
James O. Pomerlee	Gardener
Shandree Crump	Biological Aide

Plant Materials Specialists

W. Curtis Sharp, NHQ, Washington, D.C.
H. Wayne Everett, SNTC, Ft. Worth, TX.
Joel L. Douglas, AR-MS, Coffeeville, MS.

State Conservationists' Advisory Committee

L. Pete Heard, Jackson, MS
Ronnie L. Murphy, Little Rock, AR
Don W. Gohmert, Alexandria, LA
Jerry S. Lee, Nashville, TN

INTRODUCTION

The Jamie L. Whitten Plant Materials Center (PMC) located at Coffeeville, Mississippi, is operated by the United States Department of Agriculture (USDA), Soil Conservation Service (SCS). The PMC is part of a nationwide network of 26 plant material centers dedicated to finding better plants and cultural methods to meet today's conservation needs.

Purpose of the National Plant Materials Program is to provide effective vegetative solutions for improved water quality, and for conservation of our soil and water resources. The plant materials program identifies superior adapted plants, develops the techniques for their successful establishment, provides for their commercial increase and availability, and promotes their acceptance in conservation and environmental programs. Since the beginning of the Plant Materials Program, over 300 varieties of superior plants have been released nationwide to meet resource needs.

The PMC at Coffeeville began operations on August 8, 1960 and functioned as both a PMC and a seed production unit for the Yazoo-Little Tallahatchie Flood Prevention Project. The seed unit was discontinued in 1982, at which time the plant materials activities were reorganized and expanded. Since its beginnings in 1960, the PMC has evaluated over 6800 accessions of plants for many conservation purposes including: erosion control on cropland, streamchannels, and critical areas; better plants for forage, wildlife food and cover; and wetland mitigation and restoration.

The PMC works cooperatively with other agencies and organizations in the development and release of new plant cultivars. Cooperators include the Mississippi Agricultural and Forestry Experiment Station (MAFES), Mississippi Association of Conservation Districts (MACD), USDA Forest Service, USDA Agricultural Research Service (ARS), and various colleges and universities. Additionally, the PMC has cooperative agreements with the National Park Service (Natchez Trace Parkway), and the Corps of Engineers Waterways Experiment Station (WES) for the production of native plant materials and research on wetland plants.

LOCATION AND FACILITIES

The Jamie L. Whitten Plant Materials Center is located within the boundaries of the Holly Springs National Forest. The facility is headquartered on Mississippi Highway 330 between Coffeeville and Tillatoba, Mississippi. The headquarters area is about five miles east of U.S. Interstate Highway 55. Facilities consist of offices and laboratory spaces, a greenhouse complex, seed cleaning and warehouse buildings, equipment storage and shop areas, and fuel, fertilizer, and herbicide storage buildings. Specialized aquatic cells, a constructed wetland, and two irrigation storage lakes are also an integral part of the PMC.

Facilities have been extensively upgraded since 1990 to meet expanded mission goals and future needs. Its laboratory became functional for testing water samples in 1993. Forage testing will begin in 1994. The PMC, now designated as a regional Plant Materials Center, services the plant material needs of parts of Mississippi, Arkansas, Tennessee, Kentucky, Missouri, Louisiana, and Alabama, (Figure 1), and will provide for the water and forage testing needs of other PMC's. The PMC actively seeks working relationships with other governmental and military agencies, public and private organizations and educational institutions.

Land area utilized by the PMC is approximately 200 acres. It is comprised of both bottomland and upland fields, most being of irregular size and shape as defined by streams, drainages, roads and terrain. Bottomland fields are primarily Oaklimeter silt loam soils which are naturally acid and wet. With proper drainage and flood control, these soils have potential of being very productive. Soils of the uplands are predominantly Loring and Grenada silt loams with fragipans. Conditions at the PMC are typical of much of its service area, and this combination of soils types, streams and terrain provides a variety of situations for testing plants for many conservation needs.

WEATHER

Weather conditions for the 1993 growing season were generally favorable. The 1992-1993 winter temperatures were not severe, and there were no periods of extended freezes. Rainfall was below normal from January through March, and above normal in April. Although deficit monthly rainfall totals were received throughout the remainder of the growing season, rainfall distribution was favorable for plant growth and development. Temperatures were moderate until June. By July, daily highs frequently were between 90 and 100° F, with a heat index of 110-120° F. The last freeze prior to spring recovery was April 3, 1993. The first light frost was October 24, 1993. End of the growing season was marked by freezing temperature (26° F) on October 30, 1993. There were 210 freeze free growing days (04/03/93 - 10/30/93). Monthly weather data for the last quarter of 1992 and the first three quarters of 1993 is summarized in Table 1. Rainfall data was obtained from the gauge at the PMC. Climatological data from the nearby EPA Dry Deposition Station was unavailable, and the 1993 temperature summary was extracted from National Weather Service data for the local area.

TABLE 1. 1992-1993 WEATHER SUMMARY
(1 Oct 1992 - 30 Sept 1993)

Temperature (°F)

Year/Month		92 Oct	92 Nov	92 Dec	93 Jan	93 Feb	93 Mar	93 Apr	93 May	93 Jun	93 Jul	93 Aug	93 Sep
Extreme	Hi	85	77	70	71	77	82	85	87	93	97	96	93
	Lo	30	20	22	23	18	18	32	42	50	67	65	45
Monthly Average 1992-1993	Hi	72	61	52	47	54	63	72	78	87	91	89	85
	Lo	50	41	33	29	34	42	50	59	67	72	71	64
Monthly Average 1976-1992	Hi	72	60	50	46	52	62	71	78	87	91	89	84
	Lo	51	42	34	30	35	43	51	60	68	73	71	65

Yearly Average Temperature (1976-1992): Hi 70; Lo 52

Rainfall (Inches)

Year/Month	92 Oct	92 Nov	92 Dec	93 Jan	93 Feb	93 Mar	93 Apr	93 May	93 Jun	93 Jul	93 Aug	93 Sep
10/1/92 thru 9/30/93	1.69	4.82	4.00	3.78	2.97	3.33	6.44	4.35	1.70	1.16	6.14	2.37
1976-1992 average	3.99	6.55	6.14	4.22	5.05	5.74	5.58	6.24	5.05	4.11	3.06	4.31

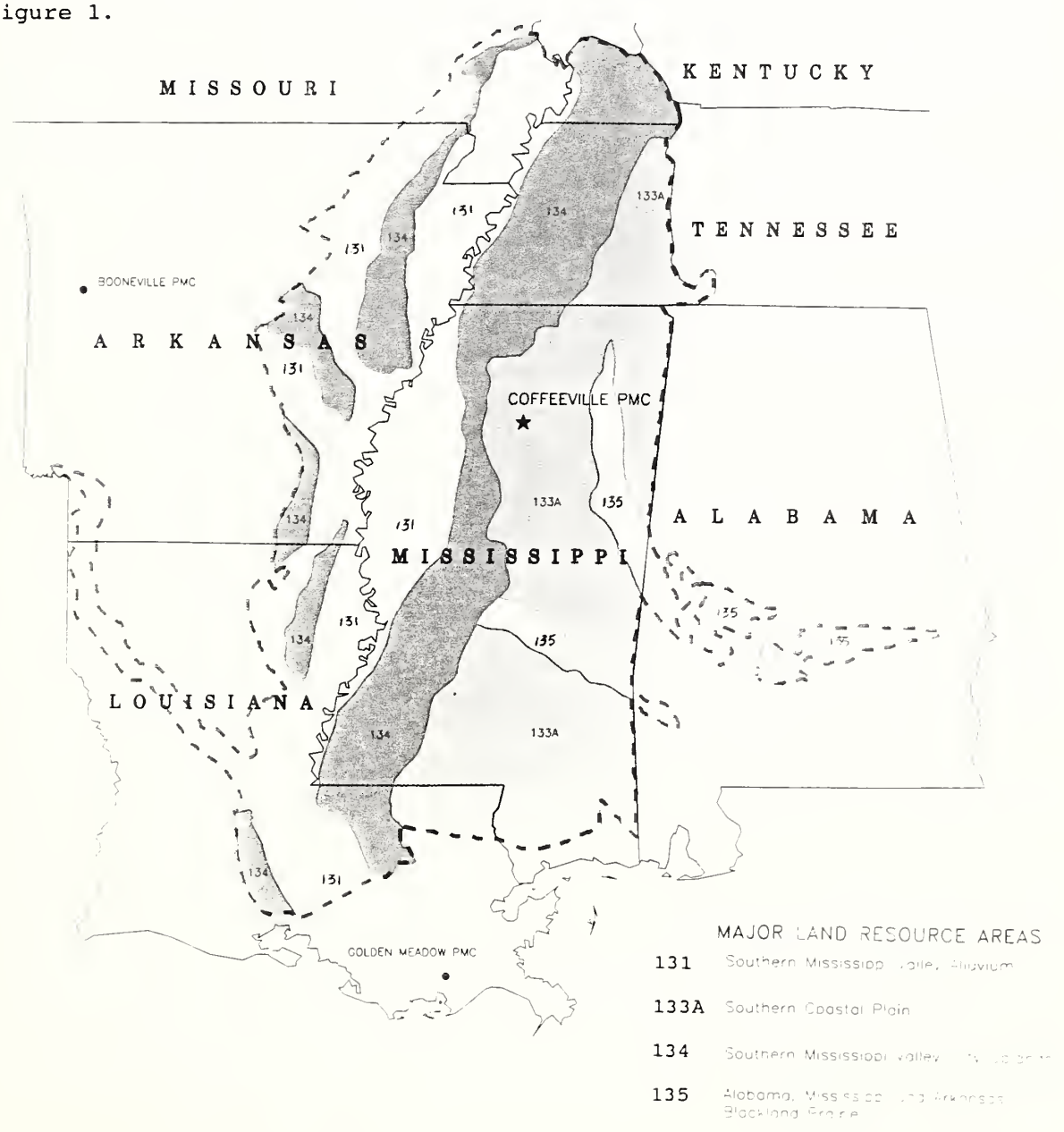
Total rainfall (10/01/92--09/30/93): 42.75 inches

Yearly Average Rainfall (1976-1992): 60.03 inches

SERVICE AREA

Primary service area of the Jamie L. Whitten Plant Materials Center includes parts of Mississippi, Alabama, Arkansas, Louisiana, Missouri, Kentucky, and Tennessee. This multi-state service area is defined by Major Land Resource Areas (MLRA) which have similar soils, climate, topography, and land use patterns. These are: MLRA 131 (Southern Mississippi Valley Alluvium); MLRA 133A (Southern Coastal Plain); MLRA 134 (Southern Mississippi Valley Silty uplands); and MLRA 135 (Alabama, Mississippi, and Arkansas Blackland Prairie).
Figure 1 identifies the Service area and the MLRA's served by the PMC.

Figure 1.



LONG-RANGE PROGRAM

Conservation problems that exist in the PMC service area have been identified in the long range program. The long range program is established by the State Conservationist's Advisory Committee to direct the plant materials activities. Outlined below are the major conservation problems and level of priority established by the State Conservationist's Advisory Committee.

CROPLAND EROSION CONTROL	PRIORITY
Winter cover compatible with no-till or conservation tillage	High
Better plants for field borders, strips and steep terraces	High
Continuous cover for cropland	Low
Inexpensive vegetative substitutes for drop structures	Medium
PASTURE AND RANGELAND EROSION CONTROL	
Perennial cool-season forage grasses	Medium
Warm-season forage grasses	Medium
Legumes compatible with grasses	Medium
WOODLAND EROSION CONTROL	
Desirable plants for clear-cut sites	Medium
CRITICAL AREA EROSION CONTROL	
Vegetation for drastically disturbed sites	Medium
Vegetation for shorelines of ponds, lakes, and streams	Medium
Plants for soil damaged by chemicals or industrial wastes	Medium
WATER QUALITY IMPROVEMENT	
Non-point pollution and contamination of groundwater	High
Removal of toxic chemicals	Medium
Animal waste treatment	High

PLANT MATERIALS TESTING PROCESS

The PMC has established a systematic testing process to provide plants to solve conservation problems identified in the long range program. Testing involves seven basic steps that determine the performance, adaptiveness, and release of plants for conservation use. Following is a description of each step involved in the testing process.

STEP 1: ASSEMBLY

Once a conservation problem has been targeted and a plant species selected with the potential to address the problem, the search for a superior plant is initiated. Plant collections are made from native or naturalized plant stands throughout the PMC service area. Periodically, collections are extended into other geographical areas where the plant is adapted for the purpose of gathering a diverse population of ecotypes or strains. Collections may also originate from foreign sources and coordinated through the Plant Introduction (PI) Stations. Seed and/or vegetative materials of grasses, forbs, legumes, and woody species are normally field collected for two years by SCS field and area personnel and PMC staff in order to provide adequate numbers for initial evaluation plantings. After the collection arrives at the PMC, it is given an accession number for identification purposes during the testing process.

STEP 2: INITIAL EVALUATIONS

Next in the testing process is the initial evaluation of the plant species. The accessions (individual collections) are either direct seeded in the initial evaluation plot or established in the greenhouse from seed or vegetative stock, and later transplanted to the initial evaluation plot. Plants are planted side by side at the PMC for meaningful comparisons. Fertilizer is used to correct major nutrient deficiencies, and provide a favorable environment for plant growth. Plantings are generally evaluated for three years. During that time, PMC personnel make visual comparisons of plant characteristics such as vigor, seed production, disease and insect resistance, heat and cold tolerance. Also, the plants are measured and dates of flowering and maturity recorded. At the end of this phase, superior accessions are selected for increase and advanced evaluations.

STEP 3: INITIAL SEED/PLANT INCREASE

Generally, before advanced evaluations are conducted and/or large scale increase fields established, initial seed increase blocks of superior accessions are established. During this stage, appropriate measures are taken to isolate superior accessions to prevent crossing and maintain genetic purity. When sufficient amounts of seed or vegetative material is available, advance evaluation plantings are made.

STEP 4: ADVANCED EVALUATIONS

During this step, superior accessions selected from initial evaluation undergo more rigorous testing. In advanced evaluations, superior accessions are compared to commercial materials, if available. Advanced evaluations may include comparative clipping trials to evaluate yield and quality of grasses and legumes, and seed yield and quality tests. Also, studies that involve developing or improving cultural and management techniques are addressed. Such studies may include establishment and management recommendations for native vegetation, or developing cultural techniques for reducing soil erosion, i.e., no-till systems for low residue crops. Personnel from state and federal agencies are encouraged to participate in these studies. Results from these studies could be adopted into the SCS standards and specifications, where applicable. Advance evaluations are generally conducted at the PMC; however, these studies may be conducted off-center where soils and climatic conditions strongly contrast with those at the PMC.

Generally, only one accession is selected for production from advanced evaluations.

STEP 5: LARGE SCALE INCREASE

During or following advanced evaluations, an accession with potential to solve the problem are established in a production field at the PMC. These production fields are irrigated and fertilized to obtain maximum seed or plant production. Seed or vegetative materials are harvested from these blocks and used in field plantings.

STEP 6: FIELD PLANTINGS

Field plantings are the final step in the testing process. Varied sites, in the PMC service area are selected to test the potentially new cultivar under actual field conditions. Plantings are conducted on soil and water conservation district cooperators farms and ranches, private industries, and federal and state lands.

STEP 7: NAME AND RELEASE

Plants that prove themselves in field plantings are given a unique name and cooperatively released by the SCS and participating state and federal agencies. Breeder and foundation seeds/plants are produced by the PMC, and made available to the state foundation seed service for distribution to commercial growers.

ACTIVE PROJECTS IN 1993

Conservation problems outlined in the PMC Long-Range Program serve as the foundation for the development of all PMC project plans. Active projects being conducted at the PMC in 1993 will be categorized according to the conservation problem it addresses in the Long-Range Program.

Cropland Erosion Control

Project: 28A801M - Arrowleaf Clover as a N Source for No-till Grain Sorghum

Stage of project: Advanced evaluations

Objective: To determine if grain sorghum can be grown successfully no-till into an arrowleaf clover cover crop and the amount of N supplied by arrowleaf clover.

Background: Published studies have shown other species than arrowleaf clover to be superior as a cover crop. However, arrowleaf clover is an excellent reseeder. Volunteer stands of arrowleaf clover have been obtained for several years at the PMC where arrowleaf clover was harvested for seed. This study was initiated to determine the amount of N supplied by the clover to grain sorghum and the number of years that arrowleaf would reseed in a row crop production system.

Significant findings: Five N rates (0, 30, 60, 90, and 120 lb/acre) were applied at grain sorghum planting. Grain sorghum emerged to satisfactory stands in all plots. Grain yield, dry matter yield, and plant height were not influenced by N rate. Clover reseeding stands were variable but no consistent trends were noted for N rates.

Project: 28A801M - Arrowleaf Clover as a N Source for No-till Cotton

Stage of project: Advanced evaluations

Objective: To determine if cotton can be grown successfully no-till into an arrowleaf clover cover crop and the amount of N supplied by arrowleaf clover.

Background: Published studies have shown other species than arrowleaf clover to be superior as a cover crop. However, arrowleaf clover is an excellent reseeder. Volunteer stands of arrowleaf clover have been obtained for several years at the PMC where arrowleaf clover was harvested for seed. This study was initiated to determine the amount of N supplied by the

clover to cotton and the number of years that arrowleaf would reseed in a row crop production system.

Significant findings: Five N rates (0, 30, 60, 90, and 120 lb/acre) were applied at cotton planting. Cotton emerged to satisfactory stands in all plots. However, competition from horse nettle (*Solanum carolinense* L.) reduced early plant growth. Cotton was not defoliated until late October due to late maturing plants. Seedcotton yield and plant height were not influenced by N rate. Due to cotton canopy cover from late September to late October, clover reseeding stands were poor.

Project: 28A801M - Evaluation of a Southernpea-Wheat Double-cropping System

Stage of project: Advanced evaluation

Objective: To determine if southernpea can be established successfully using no-till and the effects of double-cropping on plant growth and development.

Background: Mississippi has the potential to be a leading vegetable producing state in the Southeast. One of the most profitable cropping systems in the state is wheat double-cropped with soybean. However, low soybean prices have created interest in alternative crops, such as southernpea.

Significant findings: Management systems included burn straw/no-till, incorporate straw, remove straw/no-till, leave straw/no-till, no-till + 30 lb N/acre, and no-till cultivate. Plant maturity, as determined by the first harvest, was not influenced by management systems. Incorporating wheat straw produced the highest total seed yield but was not significantly different ($P>0.05$) from the total seed yield of the leave straw/no-till system. No significant differences were found between management systems for seed per pod or for g/100 seed. No-till peas fertilized with 30 lb N/acre were significantly taller than peas in remove straw, burn straw, or cultivated plots.

Project: 28A801M - Tillage and Cover Crop Effects on Peanut

Stage of project: Advanced evaluations

Objective: To determine the effects of cover crops and conservation tillage on peanut growth and development.

Background: Peanut, although grown on a small scale in the PMC service area, is one of the most erosive row crops with soil loss in excess of 22 tons/acre/year not uncommon.

Significant findings: Cover crops (crimson clover, hairy vetch, wheat, rye, and cool season weeds) were evaluated for canopy cover and dry matter (DM) yield. Cool season weeds provided ≥ 59% canopy cover from February to April which was significantly higher (P>0.05) than cover from the legumes or rye. No significant differences occurred between cover crops for DM yield. No-till planted peanut stands were satisfactory in all plots with no significant yield differences between conservation tilled/cover crop plots and conventionally tilled plots.

Project: 28A801M - Tillage and Cover Crop Effects on Sweet Potato

Stage of project: Advanced evaluations

Objective: To determine the effects of cover crops and conservation tillage on sweet potato growth and development.

Background: Sweet potato, although grown on a small scale in the PMC service area, is one of the most erosive row crops, with soil loss as high as 22 tons/acre/year not uncommon.

Significant findings: Cover crops (crimson clover, hairy vetch, wheat, rye, and cool season weeds) were evaluated for canopy cover and dry matter (DM) yield. Cool season weeds provided ≥67% canopy cover from February to April which was significantly higher (P>0.05) than cover from the legumes or rye. No significant differences occurred between cover crops for DM yield. No-till sweet potato stands were satisfactory in all plots with no significant yield or grade differences between conservation tilled-cover crop plots and conventionally tilled plots.

Project: 28C8041 - Establishment and Management of Vegetative Barriers (Hedges)

Stage of project: Advanced evaluations

Objective: To find the best suited hedge species or combination of species based on establishment factors, management requirements, and hedge density and effectiveness.

Background: Sloping cropland often requires terraces or contour filter strips in addition to conservation tillage practices for adequate soil protection. Terraces are expensive to install

and maintain, whereas grass filter strips often require an area up to 30% of the field be converted to sod. Generally, grass filter strips are not as effective as terraces.

An alternative vegetative hedge concept utilizes narrow, permanent strips of stiff, erect, dense, perennial vegetation established along the general contour of slopes, which crosses concentrated flow areas when they are encountered. Design spacing is very similar to that of parallel terraces and they usually occupy no more than 5% of the cropland field.

Status: In studies at the PMC, long-term sediment trapping effectiveness of 10 plant species is currently being measured in trials established in 1992. Vegetative hedge plots (replicated 3 times) are established on a field with 6.8% slope. Most hedges consist of a primary species and a secondary species combination.

Significant findings: On September 30, 1993 the 10 plots were rated visually for percent stand, vigor, height, stiffness, density, weed competition, gaps in hedges, and insect and disease susceptibility. An effectiveness score was assigned each plot based on a ranking of 0 (not effective) to 10 (most effective). Order of effectiveness of the 10 hedge species is provided in the attached table.

Of the 10 species, only pampasgrass had sufficient growth and density to be effective by the end of the first growing season (Fall 1992). It also was the most drought tolerant. As the hedges age, the comparative ratings may change. Most have improved significantly since the first year of establishment.

Due to the high cost of establishing vegetative materials, it appears that a predominantly seeded hedge will be more cost effective. Transplants of stiffer species would be used primarily in the concentrated flow areas. Additional species will be studied, especially those that can be direct seeded.

Table 1: Comparative ratings of 10 vegetative hedge combinations

Score	Primary Species	Secondary species
10	Pampasgrass	Creeping red fescue
9	'Alamo' switchgrass	None
8	Chinese silvergrass	Creeping red fescue
7	Native blackberry	Creeping red fescue
6	Dwarf switchcane	'Ky 31' tall fescue
5	Eastern gamagrass	Creeping red fescue
4	'Lometa' indiangrass	None
3	Giant reed	Creeping red fescue
2	'Sunshine' vetiver grass	Redtop
1	'Ky 31' tall fescue	None

Project: 28I116M - Selection of an Adapted Sour Clover, *Melilotus indica*, for Winter Cover

Stage of project: Initial evaluation

Objective: To select an adapted sourclover for use as a winter cover crop in no-till cotton production systems. Selection should have good reseeding ability, early seed maturity, low growth habit, and provide good ground cover.

Purpose: In the southeastern United States, the production of cotton, a low residue crop, is one of the highest erosive cropping practices under conventional tillage systems. Research has shown that yield of no-till cotton is equal to or greater than that of conventional tillage production systems, and is significantly more effective in reducing cropland erosion. Adapted winter legumes are needed to provide soil cover during the highly erosive winter and early spring period .

Status: Sixty nine accessions of sourclover were planted in the field in the fall of 1992, but did not survive the winter. Remaining seed of 43 accessions was replanted in replicated pots in March, 1993 and evaluated for germination, vigor, plant growth and development. The accessions remained in pots throughout the evaluation period.

Significant findings: Sour clover has not been successful as a winter cover crop at the PMC due to winterkill. It is better adapted to the milder temperatures of Louisiana, southern Alabama and southern Mississippi. Accessions identified in the 1993 trials having best vigor, foliage density, and seed production characteristics were accessions 19929, 317627, and 317630.

Project: 13A136M - Intercenter Adaptation Study of Three Crimson Clover Accessions

Stage of project: Advanced evaluations

Objective: Cooperative study with the Georgia PMC to determine the range of adaptation of three crimson clover accessions.

Background: Accessions from Georgia were compared with 'Tibbee' crimson clover. Seed of each clover was planted into a prepared seedbed on October 8, 1992. Plots (6' x 12') were fertilized with 300 lb 0-20-20/acre at planting. Clovers were evaluated from February until maturity for plant vigor, disease and insect resistance, date of bloom, and dry matter production. Rating scale for plant vigor and disease and insect resistance

was 0-9 with 0=poor and 9=excellent. Dry matter yield was determined by hand harvesting four square feet in each plot.

Significant findings: Performance of all clovers were similar during the growing season. Although 'Tibbee' flowered two weeks later than the other accessions, seed maturity date was essentially the same. No differences were noted for disease and insect damage or for cold hardiness. Plant height was 1-2 inches higher for the Georgia accessions than for 'Tibbee.' Dry matter yield for 'Tibbee' was 62% greater than the highest yielding Georgia clover.

Project: 13A137M - Intercenter Adaptation Study of Three Hairy Vetch Accessions

Stage of project: Advanced evaluation

Objective: Cooperative study with the Georgia PMC to determine the range of adaptation of three hairy vetch accessions.

Background: Accessions from Georgia were compared with an accession from Calhoun County, Mississippi and a commercial hairy vetch. Seed of each vetch was planted into a prepared seedbed on October 8, 1992. Plots (6' x 12') were fertilized with 300 lb 0-20-20/acre at planting. Vetches were evaluated from February until maturity for plant vigor, disease and insect resistance, date of bloom, and dry matter production. Rating scale for plant vigor and disease and insect resistance was 0-9 with 0=poor and 9=excellent. Dry matter yield was determined by hand harvesting four square feet in each plot.

Significant findings: Georgia accessions tended to have more foliage during the winter months and flowered two weeks earlier than the Calhoun County vetch or the commercial vetch. No differences were noted for disease and insect damage or for cold hardiness. Plant height was 3-4 inches higher for the Georgia accessions than for the others. Dry matter yield was comparable for all accessions.

Pasture and Rangeland Erosion Control

Project: 28I118M - Selection of a Superior Eastern Gamagrass (*Tripsacum dactyloides*) for the Southeast

Objective: To select an accession(s) of Eastern gamagrass for use in warm season forage production systems

Background: The 1993 growing season marked the second year of initial evaluation of Eastern gamagrass at the PMC. The assembly of 73 accessions is representative of a broad range of genetic diversity with collections made in the southeastern United States from Oklahoma to North Carolina.

Eastern gamagrass, a native warm season grass, is highly palatable to livestock. Because of its early spring recovery and vigorous growth, potential forage yield could exceed seven tons of dry matter yield per acre. If properly managed, Eastern gamagrass would make a significant impact on southern-forage and silage systems. Eastern gamagrass may also prove useful as a component in vegetative terraces, and water quality programs.

Status: The PMC is participating in a national plant materials project, which initially sought to select superior regional ecotypes for use in breeding programs for increased seed production. Since its inception, the program has undergone several changes. Studies by ARS scientist at Woodward, Oklahoma, have determined that Southeastern accessions usually have tetraploid chromosome levels, thus are apomictic, and cannot be readily improved by breeding efforts. Strategy of those PMC's in the southern U.S. now is to determine chromosome levels of their individual selections and evaluate all selections at multiple southern locations in an intercenter strain trial (ICST). Eventual release for the South will be based on performance in the ICST.

The PMC has selected its three best accessions based on seed and forage yield, vigor, and disease resistance, and will carry these into initial increase for use in the ICST. These accessions include 9058543 (Pushmataha County, Oklahoma), 9062708 (Williamsburg County, South Carolina), and 9062680 (Montgomery County, Tennessee).

Significant findings: Seed enhancement techniques, seed counts and germination studies, and forage clipping studies will assist in direction of future work at the PMC. Seed lots and subsequent germination are markedly improved by air separation. Generally, heavier, dark colored seed are fully mature and viable as opposed to lighter weight, lighter colored seed.

Clipping interval influences sustained plant performance. Intervals less than 30 days between clipping may result in a decline in plant vigor and growth, especially if stressed by other environmental pressures. An interval of 45 days would seem to be an optimum time between clipping to maintain productivity and forage quality.

Woodland Erosion Control

Project: 28A106B - Advanced Evaluation of *Strophostyles helvola*, Trailing Wildbean

Objective: To isolate pure line strains of trailing wildbean with superior seed productivity and shatter resistance

Background: Thirty two accessions of trailing wildbean were evaluated at the PMC from 1985-1988 for critical area stabilization and for wildlife food and cover. After a period of advanced evaluations, the 10 most vigorous accessions were narrowed to four selections and included 9017146 (NPMC); 90217146 (Washington County, Mississippi); 9008290 (Colorado County, Texas); and 9021719 (Crittenden County, Arkansas). A local accession (9062715) was also selected for its shatter resistance.

Status: Space planting studies were conducted in 1992 and again in 1993 to select superior plants with good shatter resistance. Emphasis was to isolate a "pure line" based on productivity, shiny, black seedcoat color, and a slick seed coat texture.

Significant findings: In the 1993 space plantings, progeny selections from the 1992 study were much weaker than the original parent population. When seed increase from the 1993 study was analyzed, it was found that 9028588, which produced both black slick, shiny seed and gray, fuzzy seed, had the highest degree of shatter resistance, but overall yield was poor. Accession 9062715 was exclusively a black, shiny, slick seed coat strain, but its yields were also poor. Highest yielding wildbean accession was 9008290. Following the 1993 trials, no further attempts to develop pure lines is planned. Rather, efforts in 1994 will be to begin seed increase of high yielding lines and work to obtain a cultivar release based on single or blended lines of highly productive, vigorous accessions.

Critical Area Erosion Control

Project: 28A482E - Biotechnical Erosion Control for Shorelines and Streamchannels

Objective: To develop recommendations of adapted plants and planting techniques for low cost, effective Biotechnical Erosion Control (BEC) applications on critically eroding streamchannels, shorelines, and steep unstable slopes in the Mid-south.

Background: Inexpensive, practical, effective and readily adaptable means of stabilizing steep slopes, and eroding streamchannels and shorelines are needed. Biotechnical erosion control, combining the use of plant materials with engineering and plant science principles, provides a cost effective alternative to the use of mechanical engineering practices for critical area stabilization.

Status: Preliminary stream plantings were conducted on Goodwin Creek in Panola County, Mississippi in 1993 to screen promising species and planting techniques. Seven herbaceous species including *Panicum virgatum* (switchgrass), *Juncus effusus* (soft stem rush), *Spartina patens* (marshhay cordgrass), *Tripsacum dactyloides* (Eastern gamagrass), *Panicum hemitomon* (maidencane), Arundo donax (giant reed), and *Arundinaria gigantea* (dwarf switchcane) were planted on a variety of sites including waters edge, vertical banks, deep, dry sands, and eroded hardpan materials. Covered, live facine bundles and live posts of fourteen woody species were also planted on the various soil conditions. Woody species evaluated were *Acer negundo* (boxelder), *Populus deltoides* (Eastern cottonwood), *Plantanus occidentalis* (sycamore), *Cephalanthus occidentalis* (common buttonbush), *Betula nigra* (river birch), *Salix gilgiana* (gilg willow), *Corylus americana* (American hazelnut), *Alnus serrulata* (hazel alder), *Populus x canadensis* (Italian hybrid poplar), *Alnus rugosa* (smooth alder), *Alnus glutinosa* (European black alder), *Ulmus* spp. (elm), *Salix cotteti* ('Bankers' willow). Evaluations were for rooting, sprouting and survival, and potential BEC effectiveness.

Significant findings: Of the 14 woody species evaluated, *Salix cotteti*, *S. rigida*, and *S. gilgiana* had best overall rooting, sprouting, and survival for both live facine bundle plantings and live post plantings. Some problems were encountered from high velocity stream flows uncovering the facine bundles and exposing them to drying. Of the herbaceous species, giant reed grew remarkably well on the deep, dry sandy site. The marshhay cordgrass and soft stem rush planted along the waterline also were well adapted. Several large storm events over the year caused considerable erosion along the banks and loss of some plants before they were firmly established.

Project: 28A101D - Critical Area and Low Maintenance Plantings Using Partridgepea, Slender Lespedeza, Purpletop, and Beaked Panicum.

Objective: To determine the establishment requirements of selected plant species for critical area stabilization

Stage of project: Advanced evaluation

Background: Partridgepea (*Cassia fasciculata*), slender lespedeza (*Lespedeza virginica*), purpletop (*Tridens flavus*), and beaked panicum (*Panicum anceps*) are useful plants for critical area stabilization of sites which have low maintenance requirements. Such sites include steep roadbanks, powerlines and utility right of ways in rough terrain, and forestry logging roads and loading sites. Trials for the four species were first planted in the fall of 1992 and a second phase planted in the spring of 1993. Each species was subjected to the following treatments: fall planting vs. early spring planting; mulching vs. no mulch; single species planting vs. planting in mixtures. Legume seed treatments were scarification vs. no stratification. Purpletop seed were hulled seed vs. unhulled seed. Site for planting was a borrow area where the top soil had been removed during construction activities.

Significant findings: Results of the 1993 establishment trials were marginal. Heavy competition from crabgrass and annual lespedeza engulfed the plots. Partridgepea was the only species that was successful in establishing. Mulched, fall planted plots of partridgepea resulted in good stands, but unmulched, spring planted plots were even better. Slender lespedeza, purpletop and beaked panicum seedlings were not found, possibly because of competition, poor seed quality, or dormancy mechanisms which have to be overcome before germination occurs.

Waterways Experiment Station Project

I. Background:

An Interagency agreement initiated in 1991 with the U.S Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi provided for the PMC to: (A) develop a directory of wetland plant vendors; (B) provide for the testing of selected plant species in Corps of Engineers drawdown areas; (C) and compile a manual on the identification, propagation, establishment, and management of wetland plant species.

II. Status of Project:

A. Wetland Plant Vendors Directory: The wetland plant vendor directory, completed in 1992, is a useful tool for locating suppliers of wetland plants for constructed wetlands, or wetlands restoration and mitigation programs. The manual is available from the WES Library, telephone (601) 634-2355. To purchase a copy, call the National Technical Information Service at (703) 487-4650.

B. Reservoir Drawdown Study: Four commercially available wetland species were established in 1992 in inundation and drought tolerance trials at

reservoir sites in Pennsylvania, Oregon, and Mississippi. Local collections of wetland species were also included. The reservoirs were Sayer Reservoir, Pennsylvania; Green Peter Reservoir, Oregon; and Grenada Reservoir, Mississippi. A planned fourth reservoir planting at Tuttle Creek Reservoir, Kansas was prevented because of high water conditions. Plant species included *Scirpus validus*, *Juncus effusus*, *Scirpus cyperinus*, *Scirpus americanus*. Evaluations were made at the Grenada Reservoir in 1993 by the PMC. Evaluation data from the other two reservoirs was provided by Corvalis PMC and Big Flats PMC.

Significant findings of reservoir drawdown study:

In 1993, survival of plants at the reservoir test sites were overall poor. At the Green Peter Reservoir in Oregon, the test plots at 3 elevations were completely inundated for 4-6 months. Three locally collected sedges, (*Carex* sp.) performed better than any of the four commercially available species that were also evaluated at that location.

Inundation of the test plots at the Grenada Reservoir varied. At elevation 1 none of the plants were inundated. At elevation 2, the plants were subjected to inundation of 6 inches for a brief period of time. At elevation 3, the plants were all inundated for five months in water five feet deep. Plant survival varied according to the inundation they were subjected to. Virtually all *Scirpus validus* and *Scirpus americanus* died at elevation 1, but were the only species to survive at elevation 3. *Scirpus cyperinus* and *Juncus effusus* had greater survival than any other plants tested at elevation 1. Some plants of all species survived at elevation 2. Those doing best were *Juncus effusus*, *Scirpus atrovirens*, and *Scirpus cyperinus*. The temporary shallow flooding was of definite benefit to the plants at this elevation.

C. Wetland Plant Manual: The wetland plant manual being compiled by the PMC will be a source of information about the natural distribution, botanical description, adaptation and use, commercial availability, propagation, and management of wetland plants. This manual will aid those persons involved in the propagation of wetland plants, or in the management and restoration of wetland and riparian zones. An intensive literature search of wetland plant related databases was made and over 3,000 articles are now being reviewed and compiled. The manual will feature over 75 wetland plant species. In 1993, write-ups were completed on twenty-nine woody plant species. Grasses and herbaceous species will also be incorporated into the manual.

National Park Service Project.

In recent years, USDA, SCS, PMC's nationwide have been cooperating with the National Park Service (NPS) producing seed and plants of selected vegetation for NPS use. The NPS requires that plant materials used for revegetating purposes must originate from within a specified section of the park boundaries. It is the PMC's task to harvest those materials from the target area and increase both seed and plants for the revegetation or reclamation activity.

In 1990, the Jamie L. Whitten Plant Materials Center entered into a cooperative agreement with the Natchez Trace Parkway. This provided for the PMC to collect and produce native plant materials for revegetation work along segments of the Parkway now under construction.

Nineteen species of grasses and forbs and six woody species were increased in 1993 under the NPS agreement. Production in 1993 included 2500 containerized shrubs, 200 bare root shrubs, and 591 pounds of seed. These materials will be used for beautification and environmental enhancement of designated sections of the Natchez Trace Parkway. These segments, now under construction, form the final links of the Parkway connecting Natchez, Mississippi to Nashville, Tennessee. This historic route was used in the late 1700's and early 1800's by riverboat men, traders and adventurers, who, having journeyed by flatboat from Nashville down the Tennessee and Mississippi Rivers to Natchez and New Orleans, returned to Nashville via the Trace.

Woody and herbaceous species being increased at the PMC:

Shrubs

Elliotts blueberry (*Vaccinium elliottii*), Carolina rose (*Rosa carolina*), Oak-leaf hydrangea (*Hydrangea quercifolia*), Witchazel (*Hamamelis virginiana*), American beautyberry (*Callicarpa americana*), Rusty blackhaw (*Viburnum rufidulum*).

Grasses

Little barley (*Hordeum pusillum*), Virginia Wildrye (*Elymus virginicus*), Winter bentgrass (*Agrostis hyemalis*), Purpletop (*Tridens flavus*), Little bluestem (*Schizachyrium scoparium*).

Forbs

Tickseed coreopsis (*Coreopsis lanceolata*), Partridgepea (*Cassia fasciculata*), Rosin weed (*Silphium integrifolium*), Sunflower (*Helianthus angustifolius*), Mistflower (Eupatorium coelestinum), Bur marigold (*Bidens aristosa*), Heartleaf aster (*Aster cordifolius*), Calliopsis (*Coreopsis tinctoria*), Blue-eyed grass (*Sisyrinchium angustifolium*), Black-eyed Susan (*Rudbeckia hirta*), Clasping coneflower (*Dracopis amplexicaulis*), Philadelphia fleabane (*Erigeron philadelphicus*), Lyre-leaf sage (*Salvia lyrata*)

Native Plant Establishment Trials

The Center began a series of trials in August, 1992 to evaluate methods for establishing the Parkways native grasses and forbs. To simulate conditions along the Trace, duplicate plots were established in an area exposed to full sun and to one being in partial shade. A combination of

three treatments are being tested: (1) Planting dates--April 1, June 1, August 1 and October 1; (2) Mulches-- Wheat straw at rate of 3 tons per acre, wood excelsior blanket, and no mulch; (3) Seeding with cover crop--native plants and cover crop blend seeded on prepared seed bed, vs. native plants overseeded into established cover crop.

Preliminary findings:

Results of the year's data indicate that the best planting dates for the native forbs and grasses was in August and October. Planting the native plants on a prepared seedbed along with the cover crop resulted in better stands than by planting into a standing cover. After planting, a mulch of wheat straw is more effective than the use of a no mulch treatment or a wood excelsior blanket.

Intercenter Strain Trials

Project: Various - Intercenter Adaption Studies

Background: Intercenter strain trials are an integral part of the plant materials testing and evaluation process. Knowing the range of adaptation of a plant selection is essential before recommending it for widespread use. Because SCS PMC's are located strategically throughout the United States, they provide convenient sites for testing plant selections and determining the adaptation of those plants to a particular area. Requests are occasionally received from other PMC's to have their selections tested at this location.

Species currently in intercenter strain trials at Coffeeville are:

common name	Genus/species	Source	Year of eval.
Smooth alder	(*Alnus serralata*)	Quicksand, KY, PMC	3rd
Sitka alder	(*A. sinuata*)	Corvallis, OR, PMC	1st
Sitka willow	(*Salix chensis*)	Corvallis, OR, PMC	5th
Hooker willow	(*S. hookeriana*)	Corvallis, OR, PMC	5th
Pacific willow	(*S. lasiandra*)	Corvallis, OR, PMC	5th
Erect Willow	(*S. ligilifolia*)	Corvallis, OR, PMC	5th
Herbaceous mimosa	(*Mimosa strigillosa*)	E. Texas PMC	2nd
Crimson Clover	(*Trifolium incarnatum*)	Americus, GA, PMC	2nd
Hairy vetch	(*Vicia villosa*)	Americus, GA, PMC	2nd
Caley pea	(*Lathyrus hirsutus*)	Americus, GA, PMC	1st

Significant findings: Smooth alder from Quicksand, Kentucky PMC is well adapted to the Mid-south. All plants are surviving and are healthy and vigorously growing. No insect, disease, or environmentally related problems are evident at this time.

The plant materials from the Corvallis, Oregon, PMC, have not grown well in Mississippi. Sitka alder, originally planted in 1991 did not survive. It was replanted at Coffeeville in 1993, but again none of the plants survived. Willows from Corvallis are subject to various insect, disease and environmental problems, and have had low survival rates and poor vigor.

Plant materials from Americus, Georgia, PMC are better adapted to conditions at Coffeeville. The Georgia selections of crimson clover grow well, but are not superior to commercially available materials currently used for cover crops. (For more detail on the performance of hairy vetch and crimson clover from Americus, Georgia, refer to Project 13A136M and 13A137M in the cropland erosion control section). Caley pea, also from Americus PMC, was fall planted in 1993. It germinates readily, grows vigorously, and is resistant to frost and moderate freezes.

PLANT MATERIALS INCREASE FOR 1993

In the plant materials process, as plants go through the various stages of testing, it becomes necessary to increase the plant materials to meet specific needs. Often, only a few grams of seed or plants of the originally collected material is available, and several years of propagation may be required to increase sufficient amounts of promising plant materials for further testing, release and eventual use. Plant materials in increase at the PMC are considered to be in either an initial, special project, or field production increase. Materials in increase at the PMC in 1993 include:

Initial Increase:

Genus/species	common name	accession
Arundo donax	Giant reed	9035156
Arundinaria gigantea	Dwarf switchcane	9035218
" "	"	9035247
Bromus uniloides	Rescuegrass	250648
" "	"	442079
" "	"	9054984
" "	"	9054989
Calamagrostis pseudophragmites	Afghan reedgrass	222041
Cassia fasciculata	Partridgepea	9021660
" "	"	9021655
" "	"	9028375
Lespedeza virginica	Slender lespedeza	9021710
" "	"	9045268
" "	"	9045294
" "	"	9045296
Miscanthus sinensis	Chinese silvergrass	434142
Panicum anceps	Beaked panicum	9028349
" "	"	9028510
" "	"	9002928
Phragmites australis	Common reed	434213
Salix cotteti	'Bankers' willow	434285
S. gilgiana	Gilg willow	9004882
S. humilis	Prairie willow	9004886
S. rigida	Erect willow	9004885
Spartina patens	Marshhay cordgrass	421237
" "	"	421238
" "	"	415141
Strophostyles helvola	Trailing wildbean	9028588
" "	"	9062715
" "	"	9062718
" "	"	9017146
" "	"	9021719
" "	"	9008290
Tridens flavus	Purpletop	9041780
" "	"	9002937
" "	"	9028375

Special Project Increase:

Waterways Experiment Station (WES)

Genus/species	common name	accession
Carex lupulina	Hops sedge	9062131
Eleochris palustris	Creeping spikerush	9062729
Juncus effusus	Soft stem rush	9062755
" "	"	9062736
" "	"	9062735
Scirpus americanus	Olney's bullrush	9062734
" "	"	9062739
" "	"	9062743
" "	"	9062730
Scirpus cyperinus	Woolgrass	9062741
Scirpus validus	Soft stem bullrush	9062740
" "	"	9062732
" "	"	9062726
" "	"	9063724

Field increase:

Genus/species	common name	Cultivar
Glycine soja	Reseeding soybean	'Quail Haven'
Trifolium vesiculosum	Arrowleaf clover	'Meechee'
Panicum hemitomon	Maidencane	'Halifax'
Echinochloa frumentacea	Japanese millet	'Chiwapa'
Paspalum notatum	Bahiagrass	'Wilmington'

PLANT MATERIAL CENTER RELEASES

The Jamie L. Whitten Plant Material Center, in cooperation with MAFES, has released five plant cultivars which are available for commercial production. Producers interested in increasing seed or plant materials of any of these releases may contact the PMC for further details. Releases of the PMC are:

'Quail Haven' reseeding soybean, *Glycine soja* Siebold & Zucc. 'Quail Haven' was released in 1986 as a wildlife plant for food and cover. Upland birds utilize the seed and deer relish the tender leaves and stems. It may also be used for hay and as summer cover for soil improvement. 'Quail Haven' is an annual, vining, hardseeded legume which reseeds readily. For wildlife plantings, some disturbance to the seedbed in early spring is beneficial for the successful establishment of volunteer stands.

'Meechee' Arrowleaf clover, *Trifolium vesiculosum* Savi. 'Meechee,' an annual, hard seeded legume, was released in 1966. It is a high producer of quality forage in spring and early summer. It has some use as a cool season cover crop, although its peak growth stage is in April and May. A commonly recommended practice is to interseed 'Meechee' with ryegrass for extended spring grazing. 'Meechee' is in full bloom in June and is very attractive to bees. Seed normally mature by late July or early August. Volunteer stands can be reestablished merely by disturbing the old seedbed in early fall following a seedcrop. Seed will remain viable in the soil for years and stands will occur many years later following a planting.

'Chiwapa' Japanese millet, Echinochloa frumentacea (Roxb.) Link. 'Chiwapa' was released for wetland wildlife use in 1965. It is a tall, robust, annual, warm season grass which, when planted on mud flats in the summer and flooded after maturity, provides food for waterfowl. Its seed resists deterioration under extended, submerged conditions. 'Chiwapa' can also be utilized as an annual forage crop for livestock, but should not be allowed to grow so rank as to have lodging problems.

'Wilmington' Bahiagrass, Paspalum notatum Fluegge. 'Wilmington,' a warm season, perennial grass was released for pasture and hay production in 1971. It is more cold tolerant in North Mississippi than 'Pensacola' bahiagrass, but low seed production restricts its availability. 'Wilmington', originally collected at Wilmington, North Carolina, has proven to be very adapted to North Mississippi and can be grown further north than the recommended range of 'Pensacola.' It is readily identified by its dark green foliage color.

'Halifax' Maidencane, Panicum hemitomon J. A. Schultes. 'Halifax,' a warm season, perennial grass, was released in 1974 for use in stabilization of stream channels and shorelines. It does not produce viable seed. Propagation is by vegetative means using rhizomes. Current interest is in the use of maidencane for stabilization of levees around catfish ponds, which are subject to extensive wave action erosion. Maidencane, which can extend out into the water as well as up the bank, moderates wave velocity, and reduces erosion potential. It does not significantly interfere with the maintenance, feeding, or harvesting operations.

TECHNICAL REPORTS

Technology transfer is a major priority at the PMC. Since 1985, numerous reports have been prepared on plant materials projects conducted on and off the PMC. Technical reports available for distribution are listed below.

1993 Reports

.Peanut Response to Cover Crops and Tillage--Herby Bloodworth
.Sweet Potato Response to Tillage and Cover Crop--Herby Bloodworth
.Evaluation of White Clover Varieties for Use in No-Tillage Systems and the Conservation Reserve Program--Joe Snider and Herby Bloodworth
.Vegetative Barriers for the Mid-South--Mike Lane
.Response of Tall Fescue and Bermudagrass to Fly Ash Treated Soil--Joe Snider
.Cover Crop Response to Soil Applied Herbicides Used in Cotton--Herby Bloodworth and Joseph R. Johnson
.Plant Materials MidSouth Newsletters, Vol. 1-4, 1993

1992 Reports

.Selection of a Cold Hardy Bahiagrass Cultivar L.H. Bloodworth, J.A. Wolfe, and J.A. Snider
.Low Maintenance Trials of Warm-Season Species on Surface Mines J.A. Wolfe
.Seed Production and Variation Among Selected Trailing Wildbean Accessions J.A. Wolfe
.Field Plantings of Afghan Reedgrass J.A. Wolfe
.Field Plantings of Four Willow Selections J.A. Wolfe
.Bluegrass Variety Trials J.A. Snider and J.A. Wolfe

1991 Reports

.Response of Selected Accessions to Common Herbicides L.H. Bloodworth
.Seed Production and Variation Among Selected Partridgepea Accessions J.A. Wolfe

1990 Reports

.Initial Evaluation of Beaked Panicum J.A. Wolfe and J.A. Snider
.Initial Evaluation of Purpletop J.A. Wolfe and J.A. Snider
.No-Till Cotton Trails: I. Establishment Methods of Cover Crops in No-Till Cotton L.H. Bloodworth
.No-Till Cotton Trials: II. Effects of Cotton Herbicides on Cover Crops L.H. Bloodworth
.No-Till Cotton Trials: III. Effects of Cover Crops on Tillage and Cotton L.H. Bloodworth

.Advanced Evaluation of Giant Reed: Comparison of a Coffeeville PMC Selection with Five Accessions from Brooksville J.A. Wolfe and B.B. Billingsley
.Initial Evaluation of Rescuegrass for Winter Cover J.A. Wolfe and J.A. Snider

1989 Reports

.Initial Evaluation of Trailing Wildbean J.A. Wolfe, J.A. Snider, and B.B. Billingsley

1988 Reports

.Arkansas Blackland Prairie Field Evaluation Planting IX: Plant Performance in Adaptation Studies J.A. Wolfe
.Investigations into the Establishment of Vegetative Flumes at the Coffeeville PMC B.B. Billingsley, J.A. Snider, and J.A. Wolfe
.Evaluation of Potential Cover Crop Species for use in Chemically Treated Cotton Fields J.A. Snider, J.A. Wolfe, and B.B. Billingsley
.No-Till Trials for Common Row Crops I. Milo Production Following Six Cover Crop Treatments J.A. Wolfe, J.A. Snider, and B.B. Billingsley
.No-Till Trials for Common Row Crops II. Establishment of Cotton and Soybean into Winter Cover Without Plowing B.B. Billingsley, J.A. Snider, J.A. Wolfe

1987 Reports

.Initial Evaluation of Partridgepeas J.A. Wolfe and J.A. Snider
.Initial Evaluation of Illinois Bundleflower J.A. Wolfe and J.A. Snider
.Advanced Evaluations of Giant Reed: I. Results of Monthly Planting Study J.A. Wolfe, J.A. Snider, and B.B. Billingsley.
.Advanced Evaluation of Giant Reed: II. Planting Position Study J.A. Wolfe, J.A. Snider, and B.B. Billingsley
.Advanced Evaluation of Giant Reed: III. Survival and Spread Study J.A. Snider and J.A. Wolfe
.Arkansas Blackland Prairie Field Evaluation Planting III: Performance of Introduced Bluestems J.A. Wolfe
.Arkansas Blackland Prairie Field Evaluation Planting IV: Performance of native Bluestems J.A. Wolfe
.Arkansas Blackland Prairie Field Evaluation Planting V: Performance of Switchgrasses J.A. Wolfe
.Arkansas Blackland Prairie Field Evaluation Planting VI: Performance of Indiangrasses J.A. Wolfe
.Arkansas Blackland Prairie Field Evaluation Planting VII: Performance of Shortgrasses J.A. Wolfe
.Arkansas Blackland Prairie Field Evaluation Planting VIII: Performance of Five Lespedeza Varieties J.A. Wolfe

1986 Reports

.Arkansas Blackland Prairie Field Evaluation Planting I: Plant Performance in Management Trials J.A. Wolfe
.Arkansas Blackland Prairie Field Evaluation Planting II: Changes in Plant Performance over Three Years J.A. Wolfe
.Rooting Trials for Promising Willows J.A. Wolfe, J.A. Snider, and B.B. Billingsley
.Advanced Evaluation of Afghan Reedgrass: I. Results of Planting Trials J.A. Wolfe and J.A. Snider
.Advanced Evaluation of Afghan Reedgrass: II. Effects of Clipping on Production J.A. Wolfe, B.B. Billingsley, and J.A. Snider

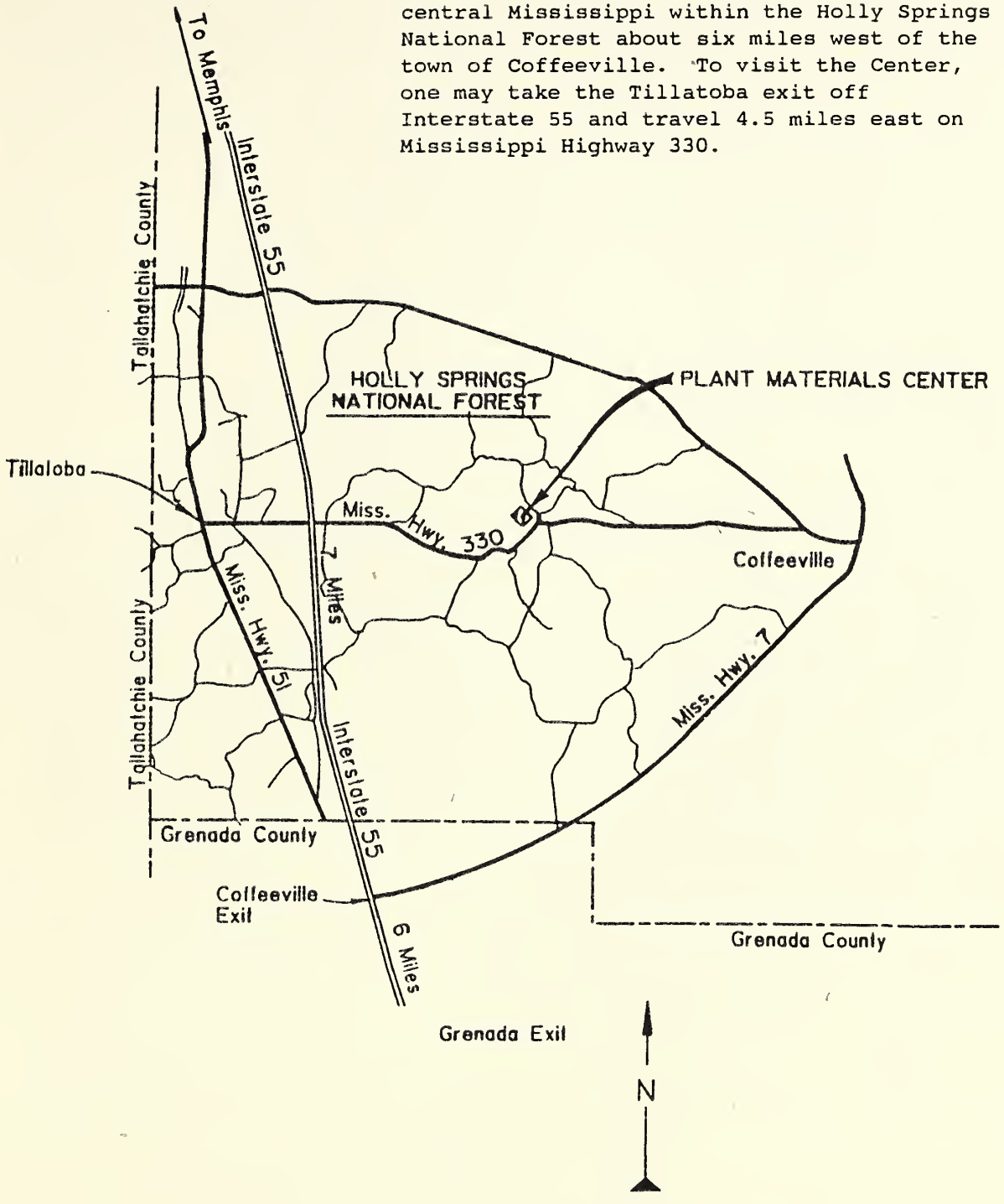
1985 Reports

.Initial Evaluation of Yellow Bluestem J.A. Wolfe, B.B. Billingsley, and J.A. Snider
.Initial Evaluation of Limpograss J.A. Wolfe, B.B. Billingsley, and J.A. Snider
.Initial Evaluation of Brunswickgrass J.A. Wolfe, B.B. Billingsley, and J.A. Snider
.Initial Evaluation of Indiangrass J.A. Wolfe, B.B. Billingsley, and J.A. Snider

Copies of these reports may be requested from:

Jamie L Whitten PMC
Route 3 Box 215A
Coffeeville, MS 38922

Jamie L. Whitten PMC is located in north-central Mississippi within the Holly Springs National Forest about six miles west of the town of Coffeeville. To visit the Center, one may take the Tillatoba exit off Interstate 55 and travel 4.5 miles east on Mississippi Highway 330.



Jamie L. Whitten Plant Materials Center
Route 3, Box 215-A
Coffeeville, MS 38922-9263
Telephone # (601) 675-2588
Fax # (601) 675-8649